

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A microelectronic imager, comprising:

an imaging unit including a microelectronic die with an image sensor and a first referencing element fixed to the imaging unit, wherein the first referencing element comprises a first alignment component for horizontal alignment and a first stop component for vertical alignment, the first alignment and first stop components being at a first reference location relative to the image sensor on the die; and

an optics unit having an optic member and a second referencing element fixed to the optics unit, wherein the second referencing element comprises a second alignment component for horizontal alignment and a second stop component for vertical alignment, the second alignment and second stop components being at a second reference location relative to the optic member and the second referencing element being seated and in direct contact with the first referencing element at a fixed, preset position in which the optic member is situated at a desired location relative to the image sensor, wherein the entirety of the optics unit is within a vertical periphery of the first alignment component.

2-4. (Canceled)

5. (Original) The imager of claim 1 wherein the first referencing element comprises a first support on the die around the image sensor and the second referencing element comprises a second support on the optics unit around the optic member, and the first support on the die is mated with the second support on the optics unit.

6. (Original) The imager of claim 1 wherein:

the imaging unit further comprises a cover over the image sensor; and

the first referencing element comprises a first support on the cover and the second referencing element comprises a second support on the optics unit around the optic member, and the first support on the cover is mated with the second support on the optics unit.

7. (Original) The imager of claim 1 wherein the first referencing element comprises a first support having a first step and the second referencing element comprises a second support having a second step mated with the first step of the first support.

8-13. (Canceled)

14. (Currently Amended) A microelectronic imager, comprising:

a microelectronic die having an image sensor and a plurality of contacts electrically coupled to the image sensor;

a first referencing element fixed relative to the die, the first referencing element having a first alignment component at a lateral distance from the image sensor and a first stop component spaced apart from the image sensor along an axis normal to the image sensor by separation distance;

an optics unit having an optic member; and

a second referencing element connected to the optics unit, the second referencing element having a second alignment component engaged with the first alignment component to align the optic member with the image sensor and a second stop component engaged with the first stop component to space the optic member apart from the image sensor by a desired distance, wherein the first alignment component is located entirely within an innermost vertical periphery of the second alignment component.

15. (Original) The imager of claim 14 wherein:

the first referencing element comprises a first support projecting from one of the die or a cover over the die, and the first support includes the first alignment component and the first stop component; and

the second referencing element comprises a second support projecting from the optics unit, and the second support includes the second alignment component and the second stop component.

16. (Original) The imager of claim 14 wherein the first referencing element comprises a first support having a first step and the second referencing element comprises a second support having a second step mated with the first step of the first support.

17. (Canceled)

18. (Currently Amended) A microelectronic imager, comprising:

an imaging unit including (a) a microelectronic die having an image sensor and a plurality of external contacts electrically connected to the image sensor, (b) a cover mounted above the microelectronic die, and [(b)] (c) a first referencing element ~~fixed~~ adjacent to the cover, wherein the first referencing element is adjacent to a top side of the cover and the microelectronic die is attached to a bottom side of the cover; ~~imaging unit;~~ and

an optics unit including an optic member and a second referencing element adjacent ~~fixed~~ to the optics unit and seated and in direct contact with the first referencing element, the first and second referencing elements being configured to align the optic member with the image sensor and space the optic member apart from the image sensor by a desired distance when the first and second referencing elements are seated together.

19. (Original) The imager of claim 18 wherein:

the first referencing element has a first interface feature at a first reference location relative to the image sensor on the die;

the second referencing element has a second interface feature at a second reference location relative to the optic member; and

the first interface feature is engaged with the second interface feature with the first reference location coinciding with the second reference location whereby the optic member is aligned with the image sensor and positioned at a desired distance from the image sensor.

20. (Currently Amended) The imager of claim 18 wherein:

the first referencing element comprises a first support projecting from the [[die]] cover, the first support having a first alignment component at a preset lateral location from the image sensor and a first stop component at a fixed, preset elevation from the image sensor; and

the second referencing element comprises a second support fixed to the optics unit, the second support having (a) a second alignment component juxtaposed to the first alignment component to align the optic member with a centerline of the image sensor, and (b) a second stop component juxtaposed to the first stop component to space the optic member apart from the image sensor by a desired distance.

21. (Canceled)

22. (Currently Amended) The imager of claim 18 wherein the first referencing element comprises a first support on the [[die]] cover around the image sensor and the second referencing element comprises a second support on the optics

unit around the optic member, and the first support on the ~~[[die]]~~ cover is mated with the second support on the optics unit.

23. (Canceled)

24. (Original) The imager of claim 18 wherein the first referencing element comprises a first support having a first step and the second referencing element comprises a second support having a second step mated with the first step of the first support.

25. (Canceled)

26. (Currently Amended) A microelectronic imager, comprising:

an imaging unit including (a) a microelectronic die with an image sensor and a plurality of external contacts electrically coupled to the image sensor, and (b) a cover attached by a lower surface of the cover to an upper surface of the microelectronic die, and (b) wherein the cover comprises a first stand-off section fixed to the imaging unit and having a first interface area at a set reference position relative to the image sensor; and

an optics unit having an optic member and a first ~~second~~ stand-off section ~~fixed adjacent~~ to the optics unit, the first ~~second~~ stand-off section having a second interface area at a set reference position relative to the optic member, and the first interface area being seated with the second interface area to connect the cover ~~first stand-off section~~ with the first ~~second~~ stand-off section in a configuration in which the optic member is at a desired location relative to the image sensor.

27. (Currently Amended) The imager of claim 26 wherein:

~~the first stand-off section projects from the die, and~~ the first interface area has a first alignment component at a preset lateral location from the image sensor and a first stop component at a fixed, preset elevation from the image sensor; and

the first ~~second~~ stand-off section projects from the optics unit, and the second interface area has (a) a second alignment component juxtaposed to the first alignment component to align the optic member with a centerline of the image sensor, and (b) a second stop component juxtaposed to the first stop component to space the optic member apart from the image sensor by a desired distance.

28. (Canceled)

29. (Currently Amended) The imager of claim 26, further comprising a second stand-off section wherein the second ~~[[first]]~~ stand-off section projects from the die to the cover and extends around the image sensor and the first ~~second~~ stand-off section projects from the optics unit and extends around the optic member, and the first interface area is mated with the second interface area.

30. (Canceled)

31. (Original) The imager of claim 26 wherein the first interface area comprises a first step and the second interface area comprises a second step mated with the first step.

32-38. (Canceled)

39. (Currently Amended) A method of packaging an imager, comprising:

providing an imaging unit having (a) a microelectronic die with an image sensor and a plurality of external contacts electrically coupled to the image sensor, ~~[[and]]~~ (b) a first stand-off adjacent to an upper surface of the die, (c) a cover adjacent to an upper surface of the first stand-off, and (d) a first referencing element adjacent to an upper surface of ~~fixed to the imaging unit cover~~ and having a first interface feature at a set reference position relative to the image sensor;

providing an optics unit having an optic member and a second referencing element fixed to the optics unit, the second referencing element having a second interface feature at a set reference position relative to the optic member; and

attaching the second referencing element to the first referencing element by seating the second interface feature with the first interface feature in a predetermined position in which the optic member is at a desired location relative to the image sensor.

40-42. (Canceled)

43. (Original) The method of claim 39 wherein the first referencing element comprises a first support having a first step and the second referencing element comprises a second support having a second step, and wherein attaching the first referencing element to the second referencing element comprises mating the first step of the first support with the second step of the second support.

44-57. (Canceled)